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TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number	10/715889
Filing Date	11/17/2003
First Named Inventor	Timm
Art Unit	3749
Examiner Name	Rinehart, Kenneth
Attorney Docket Number	1349
Total Number of Pages in This Submission	28

ENCLOSURES (*Check all that apply*)

- [x] Fee Transmittal Form
  - [x] Fee Attached
- [ ] Amendment/Reply
  - [ ] After Final
  - [ ] Affidavits/declaration(s)
- [ ] Extension of Time Request
- [ ] Express Abandonment Request
- [ ] Information Disclosure Statement
- [ ] Certified Copy of Priority Document(s)
- [ ] Reply to Missing Parts/ Incomplete Application
  - [ ] Reply to Missing Parts under 37 CFR 1.52 or 1.53
- [ ] Drawing(s)
- [ ] Licensing-related Papers
- [ ] Petition
- [ ] Petition to Convert to a Provisional Application
- [ ] Power of Attorney, Revocation Change of Correspondence Address
- [ ] Terminal Disclaimer
- [ ] Request for Refund
- [ ] CD, Number of CD(s) ____________
  - [ ] Landscape Table on CD
- [ ] After Allowance Communication to TC
- [ ] Appeal Communication to Board of Appeals and Interferences
- [x] Appeal Communication to TC **(Appeal Notice, Brief, Reply Brief)**
- [ ] Proprietary Information
- [ ] Status Letter
- [ ] Other Enclosure(s) (please Identify below):

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm Name	David J Archer M.I. Inf. Sc.		
Signature	David J Archer		
Printed name	David J Archer		
Date	08/12/2008	Reg. No.	31,076

CERTIFICATE OF TRANSMISSION/MAILING

I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below:

Signature	David J Archer		
Typed or printed name	David J Archer	Date	08/12/2008

PTO/SB/17 (10-07)
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Effective on 12/08/2004.
Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).

FEE TRANSMITTAL
For FY 2008

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) 510.00

Complete if Known	
Application Number	10/715889
Filing Date	11/17/2003
First Named Inventor	Timm
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Art Unit	3749
Attorney Docket No.	1349

METHOD OF PAYMENT (check all that apply)

☑ Check ☐ Credit Card ☐ Money Order ☐ None ☐ Other (please identify): ____

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FEE CALCULATION

1. BASIC FILING, SEARCH, AND EXAMINATION FEES

Application Type	FILING FEES Fee ($)	Small Entity Fee ($)	SEARCH FEES Fee ($)	Small Entity Fee ($)	EXAMINATION FEES Fee ($)	Small Entity Fee ($)	Fees Paid ($)
Utility	310	155	510	255	210	105	
Design	210	105	100	50	130	65	
Plant	210	105	310	155	160	80	
Reissue	310	155	510	255	620	310	
Provisional	210	105	0	0	0	0	

2. EXCESS CLAIM FEES

Fee Description	Fee ($)	Small Entity Fee ($)
Each claim over 20 (including Reissues)	50	25
Each independent claim over 3 (including Reissues)	210	105
Multiple dependent claims	370	185

Total Claims ____ - 20 or HP = **Extra Claims** ____ x **Fee ($)** ____ = **Fee Paid ($)** ____

HP = highest number of total claims paid for, if greater than 20.

Indep. Claims ____ - 3 or HP = **Extra Claims** ____ x **Fee ($)** ____ = **Fee Paid ($)** ____

HP = highest number of independent claims paid for, if greater than 3.

Multiple Dependent Claims — **Fee ($)** ____ **Fee Paid ($)** ____

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is $260 ($130 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets ____ - 100 = **Extra Sheets** ____ / 50 = **Number of each additional 50 or fraction thereof** ____ (round up to a whole number) x **Fee ($)** ____ = **Fee Paid ($)** ____

4. OTHER FEE(S) **Fees Paid ($)**

Non-English Specification, $130 fee (no small entity discount) ____

Other (e.g., late filing surcharge): Appeal Brief ____

SUBMITTED BY

Signature	David J. Archer	Registration No. (Attorney/Agent) 31,076	Telephone 815 629 2750
Name (Print/Type)	David J Archer		Date 08/12/2008

(A)

In the United States Patent and Trademark Office

Before the Board of Appeals and Interference.

Appeal Brief.

Applicant: Timm et al

USSN: 10/715889

Filed: 11/17/2003

Title: A dryer bar apparatus of a dryer.

Examiner Kenneth Rinehart.

Art unit: 3749

Docket: 1349

Mail Stop Appeal Brief

Commissioner for Patents,

P.O. Box 1450

Alexandria. VA 22313-1450

Sir,

Appeal Brief.

The following is an appeal brief filed pursuant to a Notice of Appeal filed June 12, 2008. Claims 1-14 were finally rejected in an Office Action mailed March 12, 2008. In the aforementioned final Office Action, claims 15 and 16 were allowed.

<u>Table of Contents.</u>

(C)

(i) **<u>The Real party in interest is:</u>**

Kadant Johnson Inc.

(D)

(ii) **Related appeals and interferences.**

There are no related appeals or interferences.

(E)

(iii) **Status of claims:**

Claims 1-14 have been rejected

Claims 15-16 have been allowed.

Claims 1-14 are being appealed.

(F)

(iv) Status of Amendments:

No amendment to the claims has been filed since the final rejection.

(G)

(v) Summary of claimed subject matter:

As shown particularly in Fig. 9 of the drawings and as described on page 22, line 19 to page 23, line 9:

Independent claim 1 A dryer bar apparatus 36 of a dryer 38 for drying a web W^b in a papermaking machine, the apparatus 36 comprising:

a rotatable dryer shell 12 of cylindrical configuration, the dryer shell having an outer surface 34 for drying the web W^b;

the dryer shell 12 having an inner surface 16 which defines an enclosure 14, the inner surface 16 having a radius Ri;

the enclosure 14 being connected to a source of pressurized steam 40 such that in operation of the dryer 38, a transfer of thermal energy from the steam within the enclosure 14 through the inner surface 16 of the dryer shell 12 to the outer surface 34 of the dryer shell 12 is achieved so that the web W^b is dried;

a syphon 30 disposed within the enclosure 14 for controlling a layer 32 of condensed steam 10 accumulating adjacent to the inner surface 16 of the dryer shell 12 during operation of the apparatus 36;

a specific number N of turbulence bars such as 18 to 23 are disposed within the enclosure 14 for

maximizing uniformity of the transfer of thermal energy in a cross machine direction CD and minimizing the transfer of thermal energy through the dryer shell 12 from the inner surface 16 to the outer surface 34, each of the turbulence bars such as 18 to 23 extending in a cross machine direction CD in contact with the inner surface 16, the bars such as 18 to 23 being circumferentially spaced equidistantly around the inner surface 16 of the dryer shell 12 for generating turbulence within the layer 32 so that uniformity of the transfer of thermal energy in the cross machine direction CD is maximized while the transfer of thermal energy through the dryer shell 12 from the inner surface 16 to the outer surface 34 is minimized; and

the maximizing uniformity of the transfer of thermal energy in the cross machine direction CD and minimizing the transfer of thermal energy through the dryer shell 12 from the inner surface 16 to the outer surface 34 being attained by the fitting of the specific number N of turbulence bars such as 18-23 within the dryer shell 12;

the specific number N of turbulence bars such as 18-23 being determined by the equation:

$$N = \text{int}\ \{ [2\ \pi\ Ri / [4\ \pi\ (Ri\ \delta)^{1/2} + W]\ \}$$

in which:

N= the specific number of turbulence bars in the dryer shell 12;

int= an integer number of a value in {} brackets;

$\pi = 3.1415$;

Ri = the inside radius of the inner surface 16 of the dryer shell 16 in inches;

δ = an average depth of the layer 32 in inches;

W= a width of each of the turbulence bars in inches.

Furthermore, as shown in Fig. 9 of the drawings and described on page 25, line 20 to page 26, line 18 of the specification:

Independent claim 12. A dryer bar apparatus 36 of a dryer 38 for drying a web W^b in a papermaking machine, the apparatus 36 comprising:

a rotatable dryer shell 12 of cylindrical configuration, the shell 12 defining an outer surface 34 and an inner surface 16;

a number N of dryer bars such as 18 to 23 pressed outwardly against the inner surface 16, each of the bars such as 18 to 23 extending in a cross machine direction CD along the inner surface 16; and

each bar such as 18 being spaced from an adjacent bar 19 by a quarter-resonant spacing for maximizing uniformity of the transfer of thermal energy in the cross machine direction CD and minimizing the transfer of thermal energy through the dryer shell 12 from the inner 16 to the outer surface 34, such that a rate of heat transfer through the dryer shell 12 from the inner surface 16 to the outer surface 34 is minimized while optimizing a temperature uniformity in the cross machine direction CD.

(H)

(vi) **<u>Grounds of rejection to be reviewed on appeal.</u>**

1/ Whether claim 1 is unpatentable under 35 U.S.C. 103 over Salminen US5,564,494.

2/ Whether claim 12 is unpatentable under 35 U.S.C. 103 over Salminen US5,564,494.

(I)

(vii) **Arguments.**

An essential and very important feature of the present invention is the provision of a dryer shell **(12)** with internal bars positioned and spaced as claimed, in which the transfer of heat from the inside surface **(16)** to the outside surface **(34)** of the rotating dryer shell **(12)** maximizes **uniformity** of the transfer of thermal energy in the cross machine direction **(CD)** and **minimizes** the transfer of thermal energy through the dryer shell **(12)** from the inner surface **(16)** to the outer surface **(34).**

1/ **In independent claim 1**, the specific number of bars is recited in order to **minimize** flow of heat from the steam through the dryer shell **(12)** so that the **uniformity,** in a cross machine direction CD, of the flow of heat through the dryer shell (12) is increased or maximized.

An objective of the present invention, as claimed in claim 1, is to have the same amount of heat flow through the dryer shell **(12)** all the way along the dryer shell **(12)** in a cross machine direction **CD** so that the web $\mathbf{W^b}$ will be equally dried in a cross machine direction **CD**. Claim 1 is **not** claiming **maximizing** the heat flow from the inner surface **(16)** to the outer surface **(34)** but rather **minimizing** the heat flow through the rimming condensate layer **(32)** while maximizing the **uniformity** of such heat flow in a cross machine direction **CD.**

The applied Salminen reference seeks to achieve heat transfer uniformity, but it has as a primary objective **maximizing** the transfer of heat. This reference does not give even a hint concerning the aforementioned objective of **minimizing** the transfer of heat or the surprising discovery recited in claim 1 of the present application for producing uniformity of heat transfer while

minimizing the transfer of heat. Furthermore, the applied Salminen reference does not teach the recited formula for achieving the required spacing for achieving such advantageous CD heat transfer uniformity while achieving low heat transfer. Still further, Salminen does not even teach the provision of cross-machine bars for inducing a low, but uniform, level of turbulence in the condensate layer between the bars.

The Examiner has taken the position that "applicant is merely optimizing the transfer of energy (the transfer of thermal energy in said cross machine direction or through said dryer shell being maximized or minimized, etc, uniform heat transfer with low heat transfer rate) which is well within the ability of an individual of ordinary skill. This is merely the result of the claimed spacing. The applicant is merely providing a certain number or spacing of bars to provide for an optimized result."

Appellants respectfully disagree with the Examiner's position for the following reason:

Claim 1 defines a configuration that will **minimize** the heat transfer through the dryer shell (12) from the inner surface **(16)** to the outer surface **(34)** and simultaneously achieve a flow of heat which is uniform along the CD direction, by using a unique configuration of dryer bars, while one skilled in the art would only consider dryer bars to **maximize** the heat transfer through the dryer. Such claimed arrangement is, if anything, contrary to what an individual of ordinary skill would think of doing.

More specifically, the Salminen reference makes reference in the abstract to "improved heat transfer", specifically increased heat transfer. The object of the subject invention, however, is **reduced** heat transfer, directing one skilled in the art away from the Salminen concepts.

Even more specifically, at column 8, line 38, Salminen highlights a configuration that "further enhances the rate of heat transfer". This addresses the problem of low heat transfer that occurs when the condensate is rimming and minimizes the bowing of the roll when the roll is stopped for feeding a different size or type of paper sheet through the corrugating roll. When the roll stops rotating, the steam which condenses puddles, pools or collects at the bottom of the inside surface of the roll. This layer of condensate at the bottom of the roll insulates the bottom of the roll from a flow of heat from the steam inside the roll. When the paper sheet is threaded and the roll begins rotating again after for example a 5 minute stoppage, the flow of heat through the roll will be non uniform for a considerable time after the start up even though the rimming speed has already been attained in which the condensate is evenly thrown by centrifugal force against the inner surface of the roll.

In Salminen, the aforementioned problem is addressed. However, such problem is not the problem that is addressed and solved by the arrangement recited in appealed claim 1. In the present invention, the dryer is always rotating and the condensate is always rimming inside the dryer cylinder and thermal bowing of the cylinder is not a problem to be solved.

Further, Salminen is specifically addressing the objective of **increasing** the transfer of heat from the roll by **minimizing** the thickness of the condensate layer. For example, in Col. 3 Lines 12-19, "Under rimming conditions, heat transfer is governed both by the thickness of the condensate and by fluid flow characteristics. The thinner the layer and more turbulent the flow, the less the resistance to heat transfer. Thickness of the condensate depends on the design, size, location and clearance of the siphon which extracts the condensate from the interior of the roll, roll speed and diameter, condensing rate and differential pressure. Turbulence depends on the condensate thickness and roll speed and diameter. **Minimizing** the condensate thickness, although resulting in a minimum of turbulence, will result in a **lower** resistance to, and greater uniformity of, heat

transfer." In the present invention, the condensate thickness is not **minimized** to produce **lower** resistance,'but rather is **optimized** to produce **higher** resistance to heat transfer.

Accordingly, Salminen addresses and endeavors to provide a solution to the problem of low heat transfer, but does not teach or disclose the combination claimed in claim 1 to solve the problem of non uniformity of heat transfer in the cross machine direction while **reducing** the transfer of heat.

Moreover, claim 1 provides an arrangement which greatly **reduces** the transfer of heat compared to other arrangements of dryer bars, while at the same time producing uniformity of heat transfer in a cross machine direction thus enabling the continuous production of a paper web which is dried more evenly along the width thereof in a **CD**. Such uniform **CD** drying in turn enhances any subsequent sizing, calendering or printing of the resultant web.

In the applied Salminen reference, there are no cross-machine dryer bars for generating uniformity of turbulence in the layer of condensate that would otherwise build up within the shell **(108)** thus insulating the shell **(108)** from the heat of the steam within the shell **(108)**. Instead, Salminen teaches an insert which defines a plurality of CD valleys **(130)** which increase in cross sectional area in a direction from the respective sides **(106)** of the dryer shell **(108)** towards the siphon tube **126** located midway between the sides **(106)** of the dryer shell **(108).** Thus, the thickness of the insulating condensate is greatly reduced and the heat flow through the shell **(108)** will be correspondingly increased. Such **CD** valleys **maximize** the flow of heat from the steam through the shell **(108)** in a vicinity of the sides **(106)** of the shell **(108).**

However, in the present invention, rather than **maximize** the flow of heat with an insert that **reduces** the thickness of the condensate layer and **reduces** the condensate turbulence, the present

invention **minimizes** the flow of heat by using an unique configuration of dryer bars that produce **uniform** turbulence with an **optimized** condensate layer thickness. More specifically, the present invention has a totally opposite objective and uses a totally opposite approach with its solution. The specific spacing of the bars is provided by the formula recited in claim 1 in order to **minimize** flow of heat from the steam through the shell so that the **uniformity,** in a cross machine direction **CD**, of the flow of heat through the shell **(12)** is increased or **maximized.**

2/ Independent Claim 12 recites:

"each bar being spaced from an adjacent bar by a quarter-resonant spacing for maximizing uniformity of the transfer of thermal energy in the cross machine direction and minimizing the transfer of thermal energy through the dryer shell from the inner to the outer surface, such that a rate of heat transfer through the dryer shell from the inner to the outer surface is minimized while optimizing a temperature uniformity in the cross machine direction."

An essential and very important feature of the present invention as recited in independent claim 12 is the provision of a dryer shell **(12)** in which the transfer of heat from the inside surface **(16)** to the outside surface **(34)** of the shell **(12)** maximizes uniformity of the transfer of thermal energy in the cross machine direction **(CD)** and **minimizes** the transfer of thermal energy through the dryer shell **(12)** from the inner surface **(16)** to the outer surface **(34).**

In the applied Salminen reference, there are no dryer bars for generating uniformity of turbulence in the layer of condensate that would otherwise build up within the dryer shell thus insulating the heat of the steam from the inner surface of the shell. Instead, Salminen teaches an insert which

defines a plurality of CD valleys **(130)** which increase in cross sectional area in a direction from the respective sides **(106)** of the dryer shell **(108)** towards the siphon **(126)** located midway between the sides **(106)** of the dryer shell **(108)**. Thus, in Salminen, the thickness of the insulating condensate is greatly reduced and the heat transfer rate correspondingly increased. Such CD valleys **maximizes** the flow of heat of the steam through the shell **(108)** in a vicinity of the sides **(106)** of the shell **(108)**.

However, in the present invention, rather than **maximize** the flow of heat, the opposite condition is being sought in order to **minimize** the flow of heat while at the same time maximizing the **uniformity** in a cross machine direction CD of such heat flow. The specific spacing of the bars by a quarter resonance is provided in order to **minimize** flow of heat from the steam through the dryer shell **(12)** so that the **uniformity,** in a cross machine direction **CD**, of the flow of heat through the dryer shell **(12)** is increased or maximized.

An objective of the present invention, as claimed in claim **(12)**, is to have the same amount of heat flow through the dryer shell **(12)** all the way along the dryer shell **(12)** in a cross machine direction **CD** so that the web $\mathbf{W^b}$ will be equally dried all of the way along a cross machine direction **CD** of the web.

More particularly, claim 12 is **not** claiming maximizing the heat flow from the inner surface **(16)** to the outer surface **(34)** but rather **maximizing the uniformity** of such heat flow in a cross machine direction **CD**. This is achieved by decreasing or **reducing** such heat flow of the steam through the condensate layer **(32)** to a **minimum**.

The applied Salminen reference does not give even a hint concerning the aforementioned surprising discovery recited in claim 12 of the present application. Furthermore, the applied

Salminen reference does not teach the quarter resonant spacing recited in claim 12 for achieving the advantageous result of the present invention. Also, Salminen does not teach any dryer bars.

Accordingly, Appellants are of the opinion that independent claims 1 and 12 and the claims dependent thereon recite combinations that are both novel and non obvious over the applied Salminen reference and should therefore be allowable.

Respectfully submitted,

David J. Archer

David J. Archer

Applicant's representative

Reg. No. 31,076

(J)

(viii) **Claims appendix.**

1. A dryer bar apparatus of a dryer for drying a web in a papermaking machine, the apparatus comprising:

a rotatable dryer shell of cylindrical configuration, the dryer shell having an outer surface for drying the web;

the dryer shell having an inner surface which defines an enclosure, the inner surface having a radius Ri;

the enclosure being connected to a source of pressurized steam such that in operation of the dryer, a transfer of thermal energy from the steam within the enclosure through the inner surface of the dryer shell to the outer surface of the dryer shell is achieved so that the web is dried;

a syphon disposed within the enclosure for controlling a layer of condensed steam accumulating adjacent to the inner surface of the dryer shell during operation of the apparatus;

a specific number of turbulence bars disposed within the enclosure for maximizing uniformity of the transfer of thermal energy in a cross machine direction and minimizing the transfer of thermal energy through the dryer shell from the inner to the outer surface, each of the turbulence bars extending in a cross machine direction in contact with the inner surface, the bars being circumferentially spaced equidistantly around the inner surface of the dryer shell for generating

circumferentially spaced equidistantly around the inner surface of the dryer shell for generating turbulence within the layer so that uniformity of the transfer of thermal energy in the cross machine direction is maximized while the transfer of thermal energy through the dryer shell from the inner to the outer surface is minimized; and

the maximizing uniformity of the transfer of thermal energy in the cross machine direction and minimizing the transfer of thermal energy through the dryer shell from the inner to the outer surface being attained by the fitting of the specific number of turbulence bars within the dryer shell;

the specific number of turbulence bars being determined by the equation:

$$N = \text{int}\ \{ [2\ \pi\ Ri / [4\ \pi\ (Ri\ \delta)^{1/2} + W] \}$$

in which:

N= the specific number of turbulence bars in the dryer shell;

int= an integer number of a value in {} brackets;

$\pi = 3.1415$;

Ri = the inside radius of the inner surface of the dryer shell in inches;

δ = an average depth of the layer in inches;

W= a width of each of the turbulence bars in inches.

2. A dryer bar apparatus as set forth in claim 1 wherein

the number of turbulence bars is equal to $N \pm 1$.

3. A dryer bar apparatus as set forth in claim 1 wherein

the number of turbulence bars is equal to N ± 2.

4. A dryer bar apparatus as set forth in claim 3 further including:

a further number of hoop segments spaced circumferentially along the inner surface of the dryer shell for holding the turbulence bars in contact with the inner surface;

the number of turbulence bars being a multiple of the further number of hoop segments.

5. A dryer bar apparatus as set forth in claim 1 wherein

N = 3.

6. A dryer bar apparatus as set forth in claim 1 wherein

N = 4.

7. A dryer bar apparatus as set forth in claim 1 wherein

N = 5.

8. A dryer bar apparatus as set forth in claim 1 wherein

N = 6.

9. A dryer bar apparatus as set forth in claim 1 wherein

N = 7.

10. A dryer bar apparatus as set forth in claim 1 wherein

N = 8.

11. A dryer bar apparatus as set forth in claim 1 wherein

N = 9.

12. A dryer bar apparatus of a dryer for drying a web in a papermaking machine, the apparatus comprising:

a rotatable dryer shell of cylindrical configuration, the shell defining ~~and~~ an outer and an inner surface;

a number of dryer bars pressed outwardly against the inner surface, each of the bars extending in a cross machine direction along the inner surface; and

each bar being spaced from an adjacent bar by a quarter-resonant spacing for maximizing uniformity of the transfer of thermal energy in the cross machine direction and minimizing the

transfer of thermal energy through the dryer shell from the inner to the outer surface, such that a rate of heat transfer through the dryer shell from the inner to the outer surface is minimized while optimizing a temperature uniformity in the cross machine direction.

13. A dryer bar apparatus as set forth in claim 12 wherein

the quarter-resonant spacing is determined by an equation:

$S=4\pi(Ri\delta)^{1/2}$ in which;

S= the quarter-resonant spacing;

$\pi = 3.1415$;

Ri = the inside radius of the inner surface of the dryer shell in inches;

δ = an average depth of a layer of condensed steam disposed adjacent to the inner surface in inches.

14. An apparatus as set forth in claim 12 wherein

a cross-section of each of the bars is within a range from 0.25 inches x 0.25 inches to 1.0 inches x 1.50 inches;

each of the bars is metallic and of hollow tubular configuration;

at least one hoop for pressing each of the bars against the inner surface of the dryer shell;

the at least one hoop including:

at least one segment.

15. A dryer bar apparatus of a dryer for drying a web in a papermaking machine, said apparatus comprising:

a rotatable dryer shell of cylindrical configuration, said shell defining and outer and an inner surface;

a number of dryer bars pressed outwardly against said inner surface, each of said bars extending in a cross machine direction along said inner surface;

each bar being spaced from an adjacent bar by a quarter-resonant spacing such that a rate of heat transfer through said dryer shell from said inner to said outer surface is minimized while optimizing a temperature uniformity in said cross machine direction;

a cross-section of each of said bars being within a range from 0.25 inches x 0.25 inches to 1.0 inches x 1.50 inches;

each of said bars being metallic and of hollow tubular configuration;

said apparatus including:

at least one hoop for pressing each of said bars against said inner surface of said dryer shell;

said at least one hoop including:

at least one segment;

.

said at least one hoop including:

a number of segments within a range 2 to 4, each segment having a first and a second end;

a segment fastener disposed between said first and a second end of an adjacent segment for forcing adjacent segments apart;

each fastener being threaded on one of said ends thereof;

each of said hoop segments defining a hole in each end thereof, for engagement with a segment fasteners;

each of said segment fasteners having a head that passes through said hole in said end of said segments;

a hexagonal socket head defined by said fastener for permitting tightening of said fastener by a power tool; and

a cylindrical pin for connecting each of said bars to an adjacent segment.

16. An apparatus as set forth in claim 15 wherein

said pin has an interference boss to hold said pin in said segment;

said pin having a shoulder to prevent said pin from coming out of said segment, said pin extending far enough out of said segment and into said bar so that disengagement of said pin from said segment is prevented.

(K)

(ix) <u>**Evidence appendix.**</u>

1/ **US5,564,494 to Salminen pages 1-21**

US005564494A

United States Patent [19]

[11] **Patent Number: 5,564,494**

[45] **Date of Patent: Oct. 15, 1996**

Salminen

[54] **PROCESSING ROLL APPARATUS AND METHOD**

[76] Inventor: **Reijo K. Salminen**, 373 Cove Rd., Bellingham, Wash. 98226

[21] Appl. No.: **291,115**

[22] Filed: **Aug. 16, 1994**

[51] **Int. Cl.**[6] **F28F 5/02**

[52] **U.S. Cl.** **165/89**; 34/125; 492/46

[58] **Field of Search** .... 165/890; 100/93 RP; 34/125; 162/290, 296; 492/46

[56] **References Cited**

U.S. PATENT DOCUMENTS

2,170,405	8/1939	Greenwood	34/125 X
2,521,371	9/1950	Hornbostel et al.	165/89 X
3,481,050	12/1969	Cox, Jr.	165/89 X
4,155,177	5/1979	Justus	165/89 X
4,538,360	9/1985	Chance et al.	165/89 X

Primary Examiner—John C. Fox
Attorney, Agent, or Firm—Robert B. Hughes; Hughes, Multer & Schacht

[57] **ABSTRACT**

A processing roll adapted to engage paper or the like to heat and/or shape the same. The roll has a cylindrical side wall and defines a interior condensing chamber for steam. The interior surface of the roll is formed with longitudinal grooves which slope away from the longitudinal axis toward a central location. The steam condensates in the chamber, collects in the grooves, and flows toward a center location where the condensate is siphoned out and removed from the chamber. Improved heat transfer is achieved, and greater uniformity of heat is accomplished at the outside surface.

24 Claims, 11 Drawing Sheets